UTILITY SERVICE PROTECTION STRIP

Field of the Invention

[0001] This invention relates to arrangements for protecting utility connections extending between a bulkhead and a mission module placed at a distance from the bulkhead.

Background of the Invention

[0002] Modern ships are modular, in that many of the payload portions are modules that can be installed or adapted to any ship to perform a desired function. FIGURE 1a is a simplified perspective or isometric view of a ship portion 100 including a portion 110 of a deck (interior or exterior) and a bulkhead 112. A mission module 114 is mounted on the deck 110. Various utility sources or connections are attached to bulkhead 112. More particularly, an electrical socket 116 provides alternating voltage for operating the mission module 114, and pipe outlets 118a and 118b provide for flow of coolant water. Other connections, such as 120, may be provided. Connections 120 may be for sensors or for optical fiber communications, or the like. Figure 1b is an elevation view of bulkhead 112, showing the connections.

[0003] As illustrated in FIGURE 1a, some of the various utility connections 116, 118a, 118b, and 120 are connected to the mission module 114. More particularly, electrical connection 116 is connected to mission module 114 by way of an electrical cable 121, and water

connections are made between pipe outlets 118a and 118b and the mission module by hoses or pipes 122a, 122b. It will be understood that there must be a reasonable amount of room or distance between the mission module 114 and bulkhead 112, so that the various connections can be made. Thus, there is likely to be a significant length of connection cables, wires, pipes, or hoses extending between the bulkhead and the module. Such connections pose a hazard for personnel in the area, especially considering that a shipboard environment is not always stable, given that rolling and heaving occur during inclement weather or possibly during battle. It is desirable to protect personnel from potential injury due to contact with the utility connection lines, and to protect the utility lines themselves from damage.

Summary of the Invention

[0004] A kit of parts according to an aspect of the invention comprises at least one U-channel. The U-channel comprises a planar baseplate defining upper and lower broad surfaces. The U-channel has a predetermined length in a length direction, and a width between first and second sides extending parallel to the length direction. The predetermined length is no greater than the distance between a bulkhead and a mission module between which the baseplate will installed. The U-channel further comprises first and second planar mutually parallel walls, each having the predetermined length in the length direction.

The first wall is attached to the first side of the baseplate, with the length direction of the first wall parallel with the length direction of the baseplate. The first wall has a width dimension. The first wall extends above the upper side of the baseplate, orthogonal to the upper broad surface of the baseplate. The second wall is attached to the second side of the baseplate, with the length direction of the second wall parallel with the length direction of the baseplate. The second wall has a width dimension. The second wall extends above the upper side of the baseplate and orthogonal to the upper broad surface of the baseplate. The first and second walls, together with the baseplate, define a generally U-shaped channel defining a length in a direction parallel with the length direction, and also defining a channel width. The baseplate further comprises at least a first slot in the upper surface of the baseplate. The first slot has a length extending parallel with the length direction. The first slot has at least a first predetermined width dimension. The kit of parts further includes a divider comprising a generally planar rectangular element defining a length dimension equal to the predetermined length dimension, a width dimension approximately equal to the width dimension of the first and second walls, and a first thickness along at least a selected portion of the edges thereof which is no greater than the first predetermined width of the slot. A generally planar rectangular cover is included. The cover has a length dimension equal to the

predetermined length, and a width dimension approximately equal to the channel width.

[0005] In a preferred embodiment of this aspect of the invention, the baseplate of the kit of parts further comprises at least a second slot in the upper surface of the baseplate. The second slot extends parallel with the length direction and with the first slot. The second slot has at least the first predetermined width dimension. If desired, the kit of parts may further comprise a second divider comprising a generally planar rectangular element defining a length dimension equal to the predetermined length dimension, a width dimension approximately equal to the width dimension of the first and second walls and a first thickness along at least a selected portion of an edge thereof which equals the first predetermined width of the slot. In one particularly advantageous embodiment of this aspect of the invention, the first divider comprises a monolithic flange adjacent the selected portion thereof.

[0006] According to another most preferred embodiment of this aspect of the invention, the first slot of the baseplate of the kit of parts comprises a first portion having the width. The first slot portion is adjacent to the upper surface of the baseplate and remote from the lower surface of the baseplate. The first slot also comprises a second slot portion having a second width, where the first width is less than the second width. The

second portion of the first slot is continuous with the first slot portion. In this most preferred embodiment, the divider has a region having a second thickness, greater than the first thickness adjacent the selected portion, and has a region having the first thickness at a location adjacent the region having the second thickness and more remote from the selected portion of the divider.

Brief Description of the Drawing

[0007] FIGURE 1a is a simplified perspective or isometric view, partially cut away, of a shipboard environment including a deck, a bulkhead, and a mission module, and FIGURE 1b is an elevation view of the bulkhead of FIGURE 1a, illustrating various utility connections for electricity, water, and communications;

FIGURE 2a is a simplified perspective or isometric view, partially exploded, of a kit of parts according to an aspect of the invention, for covering utility connections in the arrangement of FIGURE 1a, FIGURE 2b is a cross-sectional view of the arrangement of FIGURE 1 in a partially assembled form showing one way that an internal divider can make connection to a slot, FIGURE 2c is a plan view of the U-channel or baseplate portion of the kit of parts of FIGURES 2a and 2b, FIGURE 2d is a detail illustrating a cross-section of one kind of slot used in the U-channel of FIGURES 2a, 2b, and 2c, and FIGURE 2e is a detail illustrating another way a connection can be made to the slot of FIGURE 2d;

FIGURE 3 is a simplified cross-section of another kit of parts, partially assembled, showing a cover or lid arranged with slots for receiving upper portions of internal dividers;

FIGURE 4a is a simplified cross-section of an alternative slot and internal divider arrangement according to an aspect of the invention, and FIGURES 4b and 4c illustrate variants of the divider portions thereof;

FIGURE 5 is a simplified cross-section of an arrangement according to another aspect of the invention, similar to the arrangement of FIGURE 4a, in which the internal divider includes a flange;

Description of the Invention

[0008] In FIGURE 1a, an interior or exterior shipboard environment 100 is illustrated, showing a deck 110 and at least one bulkhead 112. A mission module is illustrated as a parallelepiped 114, and it represents any one of a plurality of possible modules, which might be combat control, radar, fire control, sonar, navigation, environmental control, or like modules. The module is placed at a convenient location on the deck. Bulkhead 112 bears utility connections, such as an electric connection or outlet 116, coolant pipe connections 118a, 118b, and communications connections 120. Space is left between the selected location of module 114 and the bulkhead 112 to allow the various utility connections to be made. For this reason, the utility connection wire cables, hoses or pipes

121, 122a, 122b, etc extend over a significant length.

[0009] FIGURE 2a illustrates a kit of parts 10 which may be useful in protecting personnel against injury to themselves or to the utility connections. In general, the kit of parts 10, when assembled, defines a box channel which lies between the bulkhead 112 and the mission module 114 of FIGURE 1a, including ramps to aid in walking over the box channel, and also including provision for separate conduits extending through the channel to separately accommodate the utility connections.

[0010] In FIGURE 2a, a generally open or U-shaped channel (U-channel) 12 is defined by a baseplate 14 and upstanding side walls 16a, 16b. The length of U-channel 12 lies in the length direction L, and the channel width CW lies in the width direction W. A height direction H is orthogonal to length direction L and width direction W. As illustrated in FIGURES 2a, 2b, 2c, and 2d, U-channel 12 includes a baseplate 14 defining upper and lower broad surfaces 14us and 14ls, respectively. The length of U-channel 14 in length direction L is some standard or predetermined length PL, such as, for example, two feet. As described below, two-foot sections of the U-channel can be concatenated end-to-end to accommodate longer channel lengths than two feet, and any requirement for a length less than two feet, to fill a length not in two-foot increments, can be accommodated by cutting a single section to the desired length. A first vertically oriented

rectangular planar side wall 16a is affixed along a first edge 14a of baseplate 14, and a second vertically oriented rectangular planar side wall 16b is affixed along a second edge 14b of baseplate 14. The lengths of planar walls 16a and 16b in the length direction L are equal to the predetermined length PL of the baseplate 14. The vertical extent or "width" ww of walls 16a and 16b are selected to provide a suitable "depth" to the channel 11 defined by the baseplate 14 and upstanding walls 16a, 16b. The depth must, of course, be enough to accommodate the utility connections, and should preferably provide sufficient extra room for expansion of the utility functions.

[0011] A set 18 of slots including a plurality of slots illustrated as 18a, 18b, and 18c are formed or defined in the upper surface 14us of baseplate 14 of U-channel 12, as illustrated in FIGURE 2a. These slots are elongated, and have a length direction which parallels the length direction L of the U-channel 12. As illustrated in more detail in FIGURE 2d, the slots such as 18a have a rectangular cross-section, and a width sw.

[0012] The kit of parts 10 of FIGURES 2a, 2b, 2c, and 2d also includes at least one interior divider element or wall, illustrated as a rectangular planar divider 20a. Divider 20a has length dl in the length direction L which equals the particular length PL of the baseplate 14 of the U-channel 12. Divider 20a also has a width or height dimension dw approximately equal to the corresponding width

or height dimensions of the walls 16a, 16b. As illustrated in FIGURE 2b, the lowermost edge of divider 20a has a thickness t, which is selected to be accommodated in a slot of width sw. In this context, the fit need not be an interference fit, but should be snug. FIGURE 2d illustrates a detail of the baseplate 14, showing the cross-sectional shape of a particular embodiment of slot 18a. Other embodiments are possible. In FIGURE 2b, the entire divider has thickness t, while in FIGURE 2e the main planar body of divider 20a has first and second broad flat sides 20afs1 and 20afs2 and a thickness Te. At the lower edge of divider 20a of FIGURE 2e, a protruding portion 20aP has a thickness t, less than the thickness Te.

[0013] As illustrated in FIGURES 2a and 2b, a planar cover 22 of kit of parts 10 is dimensioned to cover the U-channel 12. More particularly, cover 22 has a length dimension in length direction L which equals PL, the length of the U-channel 12, and has a width selected to extend between and be supported by the upper edges 16aue and 16bue, respectively, of walls 16a and 16b. For ease of referring to this dimension, it is deemed to be equal to the channel width CW, but will be understood to be greater than channel width CW by twice the thickness of a vertical wall 16a. The upper surface of cover 22 is designated 22us, and the lower surface 22ls. FIGURE 2b also illustrates that, when the divider 20a is in place within slot 18b of the U-channel, the complete channel 11 is

divided into two separate portions 11a and 11b. In the view of FIGURE 2b, it can be seen that the electrical socket 116 on the bulkhead wall is aligned with channel portion 11a, and that the pipe connections 118a and 118b are aligned with channel portion 11b.

[0014] While the kit of parts 10 has so far been described as including but a single interior divider 20a, the kit may contain a set of interior dividers including additional interior dividers, one of which is illustrated as 20b in FIGURE 2a. In general, it will not be useful to include within the kit of parts 10 a set of dividers having a greater number of dividers, such as 20a and 20b, than there are slots in set 18 of slots. Each of the dividers in set 18 of dividers will be identical to others of the set.

[0015] While not a part of the kit of parts according to the invention, the kit of parts 10 may be accompanied by an additional ramp or set of ramps. A single ramp 30 is illustrated in FIGURE 2a. The ramp has a height 30h which is substantially equal to the height at which the upper surface 22us of cover 22 lies when the kit of parts is assembled.

[0016] FIGURE 3 is similar to FIGURE 2a, and corresponding elements are designated by like reference alphanumerics. In FIGURE 3, the lower surface 22ls of cover 22 has a set 24 of rectangular slots 24a, 24b, 24c, and 24d. The widths of the slots of set 24 are selected to

accommodate the upper edge of an interior divider, and their locations are selected to overlie a corresponding slot of set 18 of slots. In FIGURE 3, each slot of set 24 of slots has a width adapted to accept upper edge 20aus of interior divider 20a, and each slot of set 24 of slots overlies a slot of set 18 of slots in baseplate 14. More particularly, slots 24a, 24b, 24c, and 24d of set 24 of slots in cover 22 overlies corresponding slot 18a, 18b, 18c, and 18n of set 18 of slots, so that any interior divider, such as divider 20a, may have its upper edge 20aue accommodated in any one of the slots of set 24. Of course, if the kit of parts 10 includes plural interior dividers, any or all may be accommodated in the assembled structure, up to a number of dividers which equals the number of available slot sets 18, 22.

[0017] FIGURE 4a illustrates an alternative shape for the lower edges of the interior dividers and slots. In FIGURE 4a, the interior divider is designated 420a, to indicate that it differs from interior dividers of set 20. As illustrated in FIGURE 4a, the lower edge portion 420aP of divider 420a defines two different thicknesses, in a configuration which has somewhat of the appearance of a flange. More particularly, the lowermost edge 420le of divider 420a has a thickness T which equals the thickness of the main portion of the divider, and a neck region 420an which has a lesser thickness t. FIGURE 4a also shows that the mating slot 418a defined in the upper surface 414us of

a baseplate 414 has a necked shape including a region 418aT with a width T and a neck region 418at connection region 418aT with the upper surface 414us of the baseplate 414. The dimensions of the slot 418a are selected to accommodate the necked region 420aP of divider 420a. In actual use, the necked region 420aP of standard-length divider 420a is slipped into the tee-slot 418a from the end of the baseplate, so the fit must be a slip fit. It will be appreciated that once installed, the divider 420a of FIGURE 4a cannot come loose from the baseplate 414.

[0018] FIGURE 4b shows the edge portion 420aP2 of an alternative interior divider, in which the lowermost portion has a thickness T′ greater than the thickness of the main body of the divider. FIGURE 4c shows a divider 420a′ in which the protruding portion 420aP3 having thickness T′′ is attached directly to the lowermost edge of the full-thickness (t) portion of the body of the divider. The shape of the slot to accommodate the protrusions 420aP2 or 420aP3 must, of course, correspond with the shape of the protrusion with which it is to be used.

[0019] Those skilled in the art will recognize that if lateral forces are repeatedly applied to the upper edges of the dividers illustrated in FIGURES 4a or 4b, stresses may form in the neck regions 420an, which may undesirably result in fracture at the neck and loosening of the divider from the baseplate. The arrangement of FIGURE 5 can aid in overcoming such stresses. The arrangement of FIGURE 5 is similar to that of FIGURE 4a, but further

includes a flange region. More particularly, in the arrangement of FIGURE 5, an interior divider designated generally as 520a includes a generally planar body portion defining first and second broad surfaces 520afs1 and 520afs2. A protruding lowermost portion 520aP defines a neck portion 520an with a thickness t and a further portion 520ale with a thickness T. A tee-shaped slot defined in the upper surface 514us of a baseplate 514 includes a region 518aT having a thickness or width T', together with a neck portion 518at of thickness t which connects region 518aT with upper surface 514us of baseplate 514.

[0020] In addition, the arrangement of FIGURE 5 includes a flange 540 affixed to that lowermost portion of the divider body which lies above protruding portion 520aP. As illustrated, flange 540 extends laterally away from the body portion of divider 520a, and is dimensioned to be substantially coplanar with the upper surface 514us of baseplate 514 when the protruding portion 520aP engages tee-shaped slot 518a. The flange provides a relatively large moment arm for resisting lateral forces applied to the upper edge of the divider.

[0021] A kit of parts (10) according to an aspect of the invention comprises at least one U-channel (12). The U-channel (12) comprises a planar baseplate (14) defining upper (14us) and lower (14ls) broad surfaces. The U-channel (12) has a predetermined length (PL) in a length (L) direction, and a width (W) between first (14a) and

second (14b) sides extending parallel to the length (L) direction. The predetermined length (PL) is no greater than the distance between a bulkhead (112) and a mission module (114) between which the baseplate (14) will installed. The U-channel (12) further comprises first (16a) and second (16b) planar mutually parallel walls, each having the predetermined length (PL) in the length direction. The first wall (16a) is attached to the first side (14a) of the baseplate (14), with the length direction of the first wall (16a) parallel with the length direction of the baseplate (14). The first wall (16a) has a width dimension (ww). The first wall (16a) extends above the upper side (14us) of the baseplate (14), orthogonal to the upper broad surface (14us) of the baseplate (14). The second wall (16b) is attached to the second side (14b) of the baseplate (14), with the length direction of the second wall (16b) parallel with the length direction of the baseplate (14). The second wall has a width dimension (ww). The second wall (16b) extends above the upper side (14us) of the baseplate (14) and orthogonal to the upper broad surface (14us) of the baseplate (14). The first (16a) and second (16b) walls, together with the baseplate (14), define a generally U-shaped channel (12) defining a length (PL) in a direction parallel with the length direction (L), and also defining a channel width (cw). The baseplate (14) further comprises at least a first slot (18a, 418a, 518a) in the upper surface (14us) of the baseplate (14). The first slot (18a, 418a, 518a) has a

length extending parallel with the length direction (L). The first slot (18a, 418a, 518a) has at least a first predetermined width dimension (SW, t). The kit of parts (10) further includes a divider (20) comprising a generally planar rectangular element defining a length dimension (dl) equal to the predetermined length dimension (PL), a width dimension (dw) approximately equal to the width dimension (ww) of the first (16a) and second (16b) walls, and a first thickness (t) along at least a selected (lower) portion of the edges thereof which is no greater than the first predetermined width (sw) of the slot (18a). A generally planar rectangular cover (22) is included. The cover (22) has a length dimension equal to the predetermined length (PL), and a width dimension approximately equal to the channel width (cw).

[0022] In a preferred embodiment of this aspect of the invention, the baseplate (14) of the kit of parts (10) further comprises at least a second slot (18b) in the upper surface (14us) of the baseplate (14). The second slot (18b) extends parallel with the length direction (L) and with the first slot (18a). The second slot (18b) has at least the first predetermined width (sw, t) dimension. If desired, the kit of parts (10) may further comprise a second divider (20b) comprising a generally planar rectangular element defining a length dimension equal to the predetermined length dimension (PL), a width dimension (dw) approximately equal to the width dimension (ww) of the

first (16a) and second (16b) walls and a first thickness (t) along at least a selected portion (lower edge) of an edge thereof which equals the first predetermined width (sw) of the slot (18a). In one particularly advantageous embodiment of this aspect of the invention, the first divider (20a) comprises a monolithic flange (540) adjacent the selected (lower) portion thereof.

[0023] According to another most preferred embodiment of this aspect of the invention, the first slot (418a, 518a) of the baseplate (14) of the kit of parts (10) comprises a first (418at, 518at) portion having the width (sw, t). The first slot portion (418at, 518at) is adjacent to the upper surface (14us) of the baseplate (14) and remote from the lower surface (14ls) of the baseplate (14). The first slot (418a, 518a) also comprises a second slot portion (418aT, 518aT) having a second width (T, T'), where the first width (sw) is less than the second width (T, T'). The second portion (418aT, 518aT) of the first slot (418a, 518a) is continuous with the first slot portion (418at, 518at). In this most preferred embodiment, the divider has a region having a second thickness (T, T'), greater than the first thickness (t) adjacent the selected (lower) edge, and has a region having the first thickness (t) at a location adjacent the region having the second thickness (T) and more remote from the selected (lower) edge of the divider.